

OPINION

by Associate Professor Gabriela Georgieva Kiryakova, PhD
Trakia University – Stara Zagora
on the Ph.D. thesis for acquiring the educational and scientific degree "Doctor"

Area of higher education: 1. Pedagogical sciences
Professional field: 1.3. Pedagogy of training in ...
Doctoral program: Methodology of training in information technologies

Ph.D. Student: **Vera Petkova Shopova**

Topic: **Use of information technologies for the implementation of interdisciplinary connections in natural sciences education at the pre-gymnasium level**

Scientific Supervisor: **Prof. Kosta Andreev Garov, Ph.D.**

1. General description of the submitted materials and Ph.D. student

By order No. РД-21-2451 / 15.12.2023 by the Rector of the University of Plovdiv "Paisii Hilendarski" I have been appointed as a member of a scientific jury in the procedure for acquiring the educational and scientific degree "Doctor" in the area of higher education 1. Pedagogical sciences, professional field 1.3. Pedagogy of training in ..., doctoral program "Methodology of training in information technology".

The author of the Ph.D. thesis is Vera Petkova Shopova - a full-time Ph.D. student at the Department of Mathematics, Informatics, and Information Technology Education at the Faculty of Mathematics and Informatics, University of Plovdiv "Paisii Hilendarski" supervised by Prof. Kosta Garov.

Vera Petkova Shopova has graduated from the University of Plovdiv "Paisii Hilendarski" with a Master's degree – a Biology and Chemistry teacher and Information Technology Training in pre-gymnasium level. She obtained her fourth and fifth professional qualification degrees at Trakia University and the University of Sofia "St. Kliment Ohridski". She has been working as a teacher at schools in pre-gymnasium level for over 20 years.

The set of materials follows the requirements of the Law for the development of the academic staff in the Republic of Bulgaria and the Regulations for the development of the academic staff of the University of Plovdiv "Paisii Hilendarski".

2. Relevance of the topic

In modern education, the trend is to integrate the knowledge and skills acquired in different subjects by discovering connections between them, contributing to the overall formation of learners as individuals. Interdisciplinary connections are essential for achieving higher efficiency of the educational activity and developing key competencies in the learners. Their application in developing lesson activities helps to realize an integrated learning process and a deeper understanding of concepts by students. It supports the application of acquired knowledge and skills in solving real problems.

On the other hand, the widespread penetration of information technologies (IT) invariably makes them part of the educational process. Their use in implementing

educational activities increases learners' motivation, puts them at the center of the learning, and turns them into active participants who construct their knowledge.

The problems related to the integration of IT in learning and the implementation of interdisciplinary connections are on the agenda in the educational system. In this context, the Ph.D. thesis topic is relevant and concerns issues related to the development and application in the real pedagogical process of methodological models, guidelines, and didactic learning materials, which are based on the principles of interdisciplinary relationships.

3. Knowledge of the problem

The list of references includes 101 articles and books and 32 Internet sources. It can be concluded that the Ph.D. student has studied the state of research in the field under consideration.

Vera Shopova demonstrates a knowledge of the issues related to the integration of IT in learning and interdisciplinary connections. On the basis of the studies she conducted, she defines the existing problem – lack of methodological guidelines and didactic materials for the application of IT in the real process of teaching natural sciences. The Ph.D. student offers a solution by developing and implementing an interdisciplinary methodological model for science education using IT at the pre-gymnasium level.

4. Research methodology

The research methodology used by the Ph.D. student is appropriately chosen and allows the achievement of the goal and the tasks, proven by the research results.

5. Analytical characteristics and evaluation of the research work and contributions

In the **Introduction**, Vera Shopova emphasizes the problem's relevance and analyzes various definitions and conceptions of interdisciplinary connections. The object and subject of research are indicated, the research hypothesis is formulated, and the research methods. The purpose of the Ph.D. thesis is outlined – the creation of an interdisciplinary methodological model for teaching natural sciences in the 5th, 6th, and 7th grades, which aims to increase the effectiveness of educational activities through the use of interdisciplinary connections between IT and natural sciences. Specific research tasks have been defined for its achievement, but the work on some of them is not reflected in the body text.

In **Chapter One**, Vera Shopova analyzes in detail the normative basis and the documentation approved by the Ministry of Education and Science, which outline the overall framework for IT training in a national plan. She provides example topics suitable for implementing interdisciplinary lessons involving science and IT, but her ideas could be developed and presented in more detail. Vera Shopova discusses the use of IT in the educational process, presenting various digital tools that can support work in schools. A significant place in Chapter One is devoted to interdisciplinary connections. The PhD student reviews various concepts and definitions of interdisciplinary connections and emphasizes the pedagogical aspects of the concept. She examines the possibilities of applying interdisciplinary connections in learning and integrating IT in natural science education. The chapter ends with a summary of the results.

In **Chapter Two**, Vera Shopova discusses the proposed interdisciplinary methodological model for teaching natural sciences with the application of IT. She describes in detail the goals, tasks, and expected results of each model stage and offers approaches, methods, and means for their implementation in school activities. Vera Shopova shares her experience applying the interdisciplinary methodical model by presenting seven projects for teaching 5th, 6th, and 7th-grade students. In projects description the stages of the applied model are schematically presented without the necessary details on the developed learning content, organization of learning time, assessment of the learners' achievements and other components. The chapter ends with a summary of the results.

Chapter Three is devoted to the pedagogical experiment. It was conducted in three stages – preliminary (determining), procedural (formative), and final, and Vera Shopova specifies the objectives of each of them. She has developed criteria and indicators for diagnosing the results of the pedagogical experiment, as well as the relevant tools for its implementation. It is not sufficiently clarified which of the presented projects was used in the training of the experimental group and whether the pedagogical experiment is related to them. The results were processed statistically with SPSS and visualized graphically through histograms. Appropriate tests were applied to verify the presence of statistically significant differences between the results of the control and experimental groups. The analysis proves the research hypothesis that the use of interdisciplinary connections between information technology and natural sciences leads to an increase in the quality of learning and the effectiveness of student education at the pre-gymnasium level. I recommend a more thorough formulation of the conclusions and consideration of possible limitations and shortcomings of the conducted experiment and, accordingly, of the proposed model.

In **Conclusion**, Vera Shopova summarizes the effectiveness of the proposed interdisciplinary methodological model for teaching natural sciences using IT in primary schools, which leads to an increase in the quality of the educational process.

The **Appendices** present the tests developed by Vera Shopova and used for students' evaluation and their results.

I accept the contributions formulated by Vera Shopova, which are sufficient for obtaining the educational and scientific degree "doctor":

- scientific-applied contributions – an original interdisciplinary methodological model for implementing the interdisciplinary connections between natural sciences - information technologies in learning;
- applied contributions – original projects based on the interdisciplinary methodological model, which are applied in pedagogical practice.

The relationships between the contributions, the tasks of the research, and the publications related to its topic are summarized in a table.

Vera Shopova outlines the perspectives for the future development of the proposed model and lessons by formulating various ideas and activities.

6. Assessment of the publications and personal contribution of the PhD student

Vera Shopova has presented 6 publications, 5 of them are in journals, and 3 of them were reported at scientific and practical forums. 3 citations of one of the publications were noted. The ideas presented in some of the papers directly correspond to the PhD thesis topic. The research results are published in scientific articles and available to the general public. The presented publications satisfy the minimum national requirements for obtaining

the educational and scientific degree "doctor" in professional field 1.3 Pedagogy of training in ...

I have no doubts about Vera Shopova's personal contribution to the presented publications and Ph.D. thesis.

7. Abstract

The abstract is 32 pages long and sufficiently reflects the essence and the content of the Ph.D. thesis and the main results achieved in the research.

8. Recommendations for future use of Ph.D thesis contributions and results

My recommendations to Vera Shopova are to continue her research, which is in line with the prospects outlined by her.

The creation of lesson units in other subjects based on the interdisciplinary methodological model should be accompanied by the development of detailed methodological guidelines for their use in the learning and upgrading the proposed model through the possibilities of modern digital technologies.

CONCLUSION

The research topic of Ph.D. thesis of Vera Shopova is relevant, the goals and objectives have been achieved, a pedagogical experiment has proven the defined hypothesis and there are the necessary contributions. The Ph.D. thesis meets the requirements of the Law for the development of the academic staff in the Republic of Bulgaria, the Regulations for its implementation, and the Regulations for the development of the academic staff of the University of Plovdiv "Paisii Hilendarski".

Considering all the above-mentioned, I give my **positive assessment** of the conducted research and **propose to the honorable Scientific Jury to award the educational and scientific degree "doctor" to Vera Petkova Shopova** in the area of higher education: 1. Pedagogical sciences, professional field 1.3. Pedagogy of training in ..., doctoral program Methodology of training in information technologies.

26.01.2024

Member of the Scientific Jury:
/Assoc. Prof. Gabriela Kiryakova, Ph.D./